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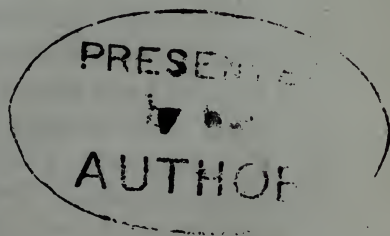
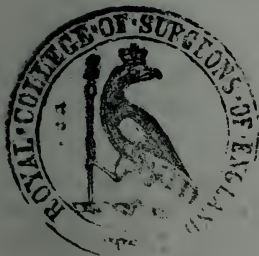
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SCURVY IN HIGH LATITUDES

AN ATTEMPT TO EXPLAIN  
THE CAUSE OF THE 'MEDICAL FAILURE' OF THE  
ARCTIC EXPEDITION OF 1875-6

BY

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## NOTICE.

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THE subject here presented to the public is cast in the form of two letters which were addressed to the Editor of 'The Times' on the 1st and 8th December respectively.

Only the first one, however, found its way into the columns of that journal. Though it does not concern the writer to know the reason why the second should have been less successful in its attempt to meet the public eye, it may not be improper to say that the able conductors of that great vehicle of public instruction had in the interval between the two—that is, on the 4th December—committed themselves to a view of the subject which was in direct opposition to that of the author, who ought not therefore to have expected that his flat and emphatic contradiction of their leading article, coming, too, immediately after it, should have received any favour at their hands.

Be this, however, as it may, the writer very gratefully acknowledges the reception of his first communica-

tion, and even thinks it his duty to allow that the second may not possibly be thought to have introduced any new points, though it certainly amplified and more fully explained those important facts which formed the basis of his argument in the first.

If, again, the length of the second letter rendered it unsuitable for the public print now referred to, the writer feels himself entitled to say that his 'physiological reasoning' could not have been more condensed without loss of perspicuity, and that, when compared with the expansion which is given to the most ordinary discussion of points, whether 'legal, political, or theological,' it may not unjustly be regarded as 'brevity itself.'

## SCURVY IN HIGH LATITUDES.



### No. I.

THERE are occasions when doctrines, even those most generally accepted, should be re-opened for discussion and subjected to the trial of extreme cases. Among these, perhaps, is the question of anti-scorbutics, so important to the health or safety of our mariners, and now brought prominently before us by the reports of our last Arctic Expedition.

No one can doubt that this great national enterprise was fitted out with every appliance which England's united wealth and science could suggest as necessary, or even desirable, both to promote the comfort and insure the health and safety of the travellers. How great, then, must have been the disappointment of those who found that it signally broke down in those very points where its success might have been thought to be best secured! Yet this failure, so unexpected by some, is exactly what others would have been led to predict or anticipate.

It is worth looking at this conflict of opinion; and the present time affords the most fitting opportunity,

when so many scientific minds are naturally turned to the subject.

The doctrine which has long prevailed in reference to 'scurvy' is that the dietary of our sailors during long voyages has been defective in one important element which was deemed necessary to maintain human life in its full vigour. The idea that referred it to the 'salted' provisions has been abandoned by general consent; it is not the presence of salt, however excessive, but the absence of fresh vegetable juices, to which scorbutic weakness is generally referred. Hence the use of lime-juice to prevent the disease, and of fresh vegetables to cure it, when our stricken sailors have arrived half dead and exhausted in our ports.

This, the orthodox theory, has never been wholly unquestioned; but, apart from the arguments laid in antagonistic experience, a very valuable remark was offered many years ago by Justus Liebig, and readily adopted by the sceptics, to the effect that when animal flesh had been preserved in brine it became necessary to wash out the salt in order to render the meat possible as an article of food, and that in washing out the salt the animal juices went along with it, so that what remained to be eaten was no better than refuse. It was, in fact, flesh from which every element of nutrition had been eliminated.

Liebig would have said: 'Let your flesh be sugar-pickled, not saturated with brine; the former method



will be the most economical, for you will thus preserve everything and have your valuable sugar in addition; while the latter process leaves your meat perfectly worthless, and you may as well reject it altogether.'

This argument was valuable in showing that what was accredited as food was in reality no food at all, and went far to explain the scurvy when it occurred in long voyages. But turn we now to the disease as it befell our Arctic travellers.

All true pathology must rest on the basis of physiological science, and be in exact harmony with its principles. Now, no one will deny that our vital heat and energy are the results of consuming oxygen, nor that Nature helps our instincts in such a way that we can in ordinary circumstances maintain the temperature of our bodies at about 98 deg. without falling into disease.

If we take too much food, Nature's kindness stores it up for us—that is, we fatten; at other times her caprice visits us with indigestion, and our sensuality is chastised. If, on the other hand, we are insufficiently fed, we may become the victims of scurvy. Look at the extremes of human existence. The Southern Spaniard lives on 'gaspacho,' little better than our salad; the tropical Indian on rice, with some spicy condiment; the inhabitant of the Arctic regions maintains his existence by whale-fat or blubber. The Asiatic is independent of the fatty element of food. The Esqui-

maux protects himself from scurvy, not by lime-juice and fresh vegetables, which are out of his reach, but by whale-fat, which Nature gives him in rich abundance. Arctic travellers and whaling captains tell us of this people 'that they are most accomplished seal and whale hunters, that they delight in blubber, and when they have obtained plenty of it they lie down on their backs to be crammed by their wives with the precious dainty, of which they are capable of devouring some 14lb. in a day.'<sup>1</sup>

Parry tells us that an Esquimaux boy ate in twenty-four hours  $8\frac{1}{2}$  lb. of seal meat, half frozen and half cooked, 1 lb. 2oz. of bread, and  $1\frac{1}{2}$  pint of thick soup, washing all this down with three wine-glasses of schnapps, a tumbler of grog, and five pints of water. We smile at such voracity, or raise the eyebrow as the guzzling urchin is presented to our imagination; but is not the strange fact thus recorded the stern exigence of physiological law? Could this Arctic people be preserved on any other conditions? Would they not otherwise be swept from the face of the earth? Take a cubic foot of air at 60 deg. and another at the low temperature of 59 deg. below zero, what will be the devouring force of oxygen in the latter compared with its small amount in the former? I have illustrated this subject *ex hypothesi* in a popular lecture on Respiration.

<sup>1</sup> See 'Quarterly Review,' October 1876. Article 'The Arctic Regions.'



tion, in which I might have done better had I substituted these real facts for my imaginary ones.<sup>1</sup>

In the country of the Esquimaux, and, *à fortiori*, in still higher latitudes, we must live as the Esquimaux. Huddled up as they are in ice and snow, and condemned for half the year to a perpetual night, they have few or no wants beyond blubber; this to them is all-sufficing. They ask for no lemon-juice; if they relied on this they would infallibly perish. Does not Nature make the same demand on us as she does on them in the same conditions? They answer this demand by giving her whale-fat, and she is satisfied. We tender our cup of lime-juice, but she, ever cruel and implacable towards error, smites us with scurvy for our ignorance.

In our next Arctic Expedition let us borrow the stomachs of the Esquimaux, and live like the Esquimaux.

Our mariners, when thus fortified against the ravages of consuming oxygen, will bid defiance to the scurvy. They will not ask for lime-juice from the West Indies, nor repine after the water-cresses of Hertfordshire.

*November 29.*

<sup>1</sup> Lecture on 'Respiration, or Why do I Breathe?'

## No. II.

It has been playfully said of the members of my profession that even the best of us would make but sorry stable-boys, and that our services in this respect would be held in little esteem at the famed hunting-resorts of Leamington or Sherborne. This well-feathered shaft is doubtless aimed at our too frequent habit of putting the saddle on the wrong horse; still, if we are to be considered as fair game in this matter, our defence or apology must be laid in the extreme difficulty of our inquiries, for on no other ground can we be fairly exposed to such exclusive banter.

Be this, however, as it may, our sagacity at the present moment is sorely tried in fitting the saddle to the right back in this great question about 'scurvy in high latitudes.'

In my last letter (Dec. 1) I endeavoured to point out the lines of philosophic thought on which the solution of this interesting problem must be sought, and I referred your readers to the great unquestioned fact of the immunity of the Esquimaux from that disease, which has proved the scourge of our Arctic travellers.

My argument was:—The Esquimaux are men like

ourselves ; take them to pieces as the anatomists do, we find no difference between us. Oxygen and carbon must be to them exactly what they are to us ; surely, then, we are in the same physiological boat. An Esquimaux brought within the temperate zone must forego his Arctic life, or he will speedily become diseased and perish. A European, when transferred to Arctic regions, must adopt the life of those latitudes, or the same fate will inevitably await him.

It has been said, ‘ I grant your case in regard to the Esquimaux, but you cannot thus bridge over the gulf which separates him from the European. The Esquimaux, I admit, is independent of fresh vegetables ; experience proves it to be otherwise in the case of Europeans.’ This objection is a double-edged one ; but on one side it is fanciful, or gratuitous and unfounded, and therefore requiring no further answer than what I have already given ; on the other it involves a ‘*petitio principii*’—it asks us to concede the very question in dispute. On one side it denies the physiological identity of the Esquimaux with ourselves ; on the other it asserts the need of lime-juice, or fresh vegetables, which is the very point we have to try.

The object of my letter to-day is not so much to offer facts as to place before your readers the scientific bearing of those to which I have already referred. Still, as facts are of so great value, you will perhaps allow me to add one or two to those I have already given.

One of your readers—a gentleman high in the civil service of the Navy—on reading my letter of the 1st inst., sent me the following :—

‘ In one of his [Sir John Richardson’s] expeditions, he found his men losing strength very rapidly, although in full allowance of provisions, and becoming daily more and more dispirited without any assignable cause. At the same time he observed that the Esquimaux of his party were thriving and jolly as usual ; they were living on blubber, and when he persuaded his men to take to the same kind of food, they rapidly recovered.’

It is very rare for London physicians to see cases of scurvy such as they are presented at our sea-ports.

Still, having been for many years physician to the old ‘ Dreadnought,’ I am as familiar with it as with the most common diseases of our London hospitals. In many cases which I had to treat there I never thought or found it necessary to give my patients any of the so-called anti-scorbutics, but found that milk, soft bread-and-butter, anything, in fact, that was suitable for very tender gums, was all that was required for their recovery in the first instance. After a time, no doubt, when their cure was more than half effected, they had the ordinary diet of convalescent patients, which included potatoes or other articles of supposed anti-scorbutic virtue.

It happened to me once to have some patients

from a ship which had been shamefully provisioned in other respects, but yet was furnished with lime-juice. The men were badly stricken. I asked one of them if the scurvy, which had so severely fallen on them, made great ravages in the cabin. 'Did the captain, the mate, or the cook suffer much?' 'No, the d——d rascals,' was the blunt reply; an expression which clearly meant that the good things of the cabin had not descended to the fore-castle. Let such facts suffice, and pass we now to their scientific bearing.

The living being—'man'—is simply a machine, which is to do so much work, and maintain itself at a temperature of about 98 deg. The whole gist of our great question lies in this little nutshell.

To keep himself up to 98 deg. is man's paramount necessity. The barbarian does this by an instinct which is successful; our imperfect knowledge leads us astray, and we miserably fail. What, let us ask, is the secret of the barbarian's success? He lives on blubber—it is nothing else. His temperature is not higher than ours, his work is not greater. The pounds of whale-fat he has consumed have gone out of his body by the breath—i.e. in water and carbonic acid. It is this combustion of his food which has kept up his temperature, whilst his body at the same time has maintained its integrity. He does not fatten under his gross feeding; he remains the same whilst in health. By his breath he has pulled in just so much



oxygen as has sufficed to burn the oil which is required to do his mechanical work and keep his body up to 98 deg. The amount of oxygen which is necessary for him to do this is the exact amount which is necessary for ourselves in the same conditions.

With such knowledge before us, let us now listen to the voice of Nature. She, ever faithful to her duty, thus addresses our Arctic travellers: 'You ask of me that I shall maintain the heat of your bodies at a temperature of 98 deg, when the thermometer stands at 60 deg. below zero. I am ready to do this; I do it for the Esquimaux; I will do it also for you. I will send into your bodies just so much oxygen that shall kindle a fire which will be exactly equal to the effect. That is all I can do—it shall be your duty to supply the fuel; but, mark me, if you give it not in food, I will rend it out of your bodies by force; for as long as you have life, I will have it, and will take it even to your destruction.'

Need we invoke mathematical aid to prove that a cup of lime-juice will not satisfy this demand, nor that it will utterly fail to meet the claims of so much oxygen as shall convert a bladder of lard or a gallon of oil into its equivalent of water and carbonic acid?

When a person has something disagreeable or painful to communicate, kind feeling demands that he shall 'break the news' softly, and thus avoid all unnecessary offence. My first letter was therefore couched in language of studied gentleness. I spoke with almost



‘bated breath, and whispering humbleness.’ Such speech was proper at the time, but would not become me now. When a great principle is at stake—when the public mind has to be disabused of a mighty error, to which it fondly clings with such tenacity, even hugging it to its own destruction—to make a truce with falsehood would be treason ; there cannot be even the semblance of a compromise. It is therefore my duty to proclaim in language that cannot be misunderstood that the doctrine of anti-scorbutics is utterly rotten and untenable ; it is indeed the last remnant of a bygone and obsolete physiology. There is now NO anti-scorbutic, or, in other words, all food is anti-scorbutic, though in most unequal degrees. Fat and oil stand at the head of the class, of which whale-fat or blubber is perhaps the best representative. Sugar has a high place in the scale, containing as it does some six pounds of carbon in every fifteen pounds. Potatoes rank high (*testetur Hibernia*) on account of its starchy elements, so readily convertible into glucose.

Lime-juice, long esteemed the ‘*dux summus*’ of the class, stands very low indeed. It would be inferior to barley-water in keeping scurvy at bay, and would be on about the same level with toast-water. Take a puncheon of it, evaporate it to dryness, weigh the residue :

Expende Hannibalem, quot libras in ‘duce summo’  
Invenies ?

Burn it, reduce it to ash and carbonic acid ; ask the

chemist how much oxygen it has taken to do this, and he will tell you to a decimal of a grain.

Whatever answer he may give you, that will represent its anti-scorbutic virtue.

He who shall write a philosophic history of medical science, and shall possess the genius to perceive what lights have arisen from time to time, making the dark things of the past to shine with the brightness of noon, will tell us—that the chemistry of Liebig and of Liebig's time made physiology a new science,—that it completely transformed it,—and that, amongst other benefits it conferred, it forged a weapon which gave the death-blow to the doctrine of anti-scorbutics, just as the theory of Phlogiston fell before the burning light that was shed abroad by the discoveries of Priestley.